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Smallholding production of cotton: challenges ahead

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It is somewhat tricky to talk about developing countries whose composition varies depending on country classification, on organizations dealing with grouping countries. Production mode could also vary within a specific developing country. I let you read the various denominations of groups of countries for the single organization of UNCTAD. While other denominations and criteria could be found with other international organizations. So, it sounds more relevant to cope with small farm holding production of cotton because, implicitly, it refers to developing countries according to the income criterion.

Smallholding of production is frequently characterized by the small size, its dominant contribution to family subsistence, the feature of little mechanization and the increasing constraint of family labour availability, the low education level of farmers, and the dependence on rains and policies.

What does smallholding production represents? There is no specific record of the related data although it is relevant and feasible. According to my attempt to estimate, not perfectly, smallholding farms contribute for 70-75% of total cotton area and production. This is an important share which justifies our attention.

There are a lot of constraints that smallholding cotton producers are facing. It is analytically convenient to address them separately to identify solutions but, in practice, solutions have to be combined because constraints are interrelated.

The subsistence feature of smallholding cotton production has led to the frequent perception of cotton-food competition. A frequent behaviour has been, and still, is to overlook the assistance to food production in cotton areas. This behaviour is questionable. There are historic illustrations, notably in Africa, indicating that cotton could benefit from productivity gain in food, and reversely. These are some pictures of actions to which I contributed to promote maize production within a cotton company in Mali with assistance provided from field to market levels, up to initiative to delay sales thanks to improved granaries, a time when cotton production increased.

You are aware of the limited extent of mechanization in many small farms. Farming could be totally manual. When machines exist, they are used for a limited number of cultivation operations, even when high priced conventional tractors are being used, although obtained at second hand. There is a technology challenge to carry out machines adapted to small or mid-size farming size. There are already a few achievements in this area. But more important is to address the organizational and institutional challenge to overcome the financial resource limitation of farmers and enable a majority of them to benefit.

There are some achievements for mechanized sowing, if not motorized sowing. There are some attractive innovations like this 3-wheel multi-purpose tractor I have been introduced to in China. It is possible to adjust the height of the tools so that operations can be implemented even cotton plants have grown up.

But the biggest challenge remains with harvest. The reduction of the size of cotton pickers is under consideration if not used, but it is doubtful it could imply sufficient cost reduction and be affordable to many. I am not sure that the manual sucking machines under experimental use are so much productive. So the breakthrough technology is yet to come.

The small cotton area implies constraints at the cotton sector level by increasing transaction cost from field to gin and by impacting cotton lint quality through notably heterogeneity. Organizational solutions have proved to be successful in passing the marketing task to producers and in imposing a limited number of varieties.

The constraint at the farmers' level is furthermore challenging in terms of producing more on small land. The common answer is to increase yield while the supplementary solution of improving the rate of land use has been often overlooked.

The improvement of yield used to be expected from higher intensive use of chemicals that farmers might not be able to afford or be willing to accept the related financial risk. This is why the improvement expected seldom materialized except when farming was financially supported. It is more sustainable to implement biological controls but investment is needed to pass the knowledge through adapted training. Here is an illustration of the push-pull approach to control pests, making use of service plants to push pests out of the field and to attract them in other plants which could tolerate them without damage. The use of deep-rooting trees is a solution implemented in Zambia to pump up nutrients in depleted soils and reduce fertilizer use.

The approach of increasing the rate of land use has been neglected if not banned for a long time. The objective is to harvest more crops a year and on any space available. China is emphasizing a lot the development of multi-cropping modes through inter-cropping and relay-cropping. There are experiments to harvest three crops during one cycle of cotton.

The time is often over when family labour is plenty and available. So it is of utmost importance to reduce labour requirement and to improve labour efficiency. The use of herbicides is already widespread in some countries but it mainly enables to control weeds early in season and manual weeding remains needed but not implemented optimally. There are techniques or implements to help achieve chemical weed control selectively, as it was tested in Cameroon and executed in Zambia.

There are also ways to improve the labour efficiency in some operation, like at sowing. In Francophone African countries, the customs of sowing at high seed dosage is questionable because thinning is required while it is frequently implemented lately at the expense of the yield expectancy.

Smallholding farming is frequently not irrigated so that production is highly dependent of rainfalls which have become less predictable under climate change. In the same time, a majority of water from rains is lost with negative impacts. There is an urgent but exciting challenge to better capture water from rainfalls. But it could not be overcome without collective will and organizational if not

political support. Farmers of Rajasthan are overcoming the challenge without political support through the revival of the traditional technique of 'johads' to capture water.

The solutions quickly introduced sound like utopias given the low educational level of farmers, but the technologies in the information and communication area can help. In all francophone African countries, and this should be true also elsewhere, farmers have already mobile phones. There are experiences of e-farming support. Radio broadcasting should not be put aside because of the modern communication technologies. There is room to combine mobile phone use and radio broadcasting so as to adapt to farmers' availability, instead of expecting farmers to adapt to broadcasting pre-established schedule.

Finally, cotton policy is needed. I think that most people have realized the wrongness of the claim that the best policy is no policy at all, as it was the unfortunate case during the implementation of structural adjustment plans. How to figure out an efficient cotton policy is a big issue and it cannot be addressed in generic terms. Here are some items for the orientation of efficient cotton policy. I let you read and would not elaborate because there has been a specific session about that.

In a nutshell, there are many challenges ahead, but there are solutions in sight. Solutions would not occur by magic. Investment is needed, particularly in research. The implementation of research and extension has to be adjusted while the production environment has to be made more conducive for technical change.

Challenges identified are inter-related, so must be solutions to overcome them. This reality is making more crucial the need to improve the production environment. How to reach this goal? Market force is not sufficient by itself. Some public intervention is required.



3rd breakout session
New Challenges to Cotton:
The Perspective of Developing
Countries

Smallholding production of
cotton: challenges ahead

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Developing countries: Tricking issue

- Great diversity of Developing countries
- Classification of countries might vary and be surprising
 - WTO: self declaration
 - UNCTAD: most comprehensive, albeit debatable sometimes
- Diversity of (cotton) production modes within a developing country

Some examples of denominations by UNCTAD

- Developing countries without China
 - Hong Kong !
- Developing countries with high income
- Developing countries with intermediary income
- Developing countries with low income
- Developing countries without Least Developed Countries
- Least Developed Countries
- Land locked Least Developed countries

Classification by the other international organizations or criteria

■ The World Bank

- Criteria = income level (& OECD member or not)

■ The IMF

- Poor and high debt countries

■ Other classification criteria

- Income level and food deficit
- Net food import
- Agricultural product export
- Mineral export
- Oil export
- ...

Better to focus on small farm holding production

- Implicitly in developing countries



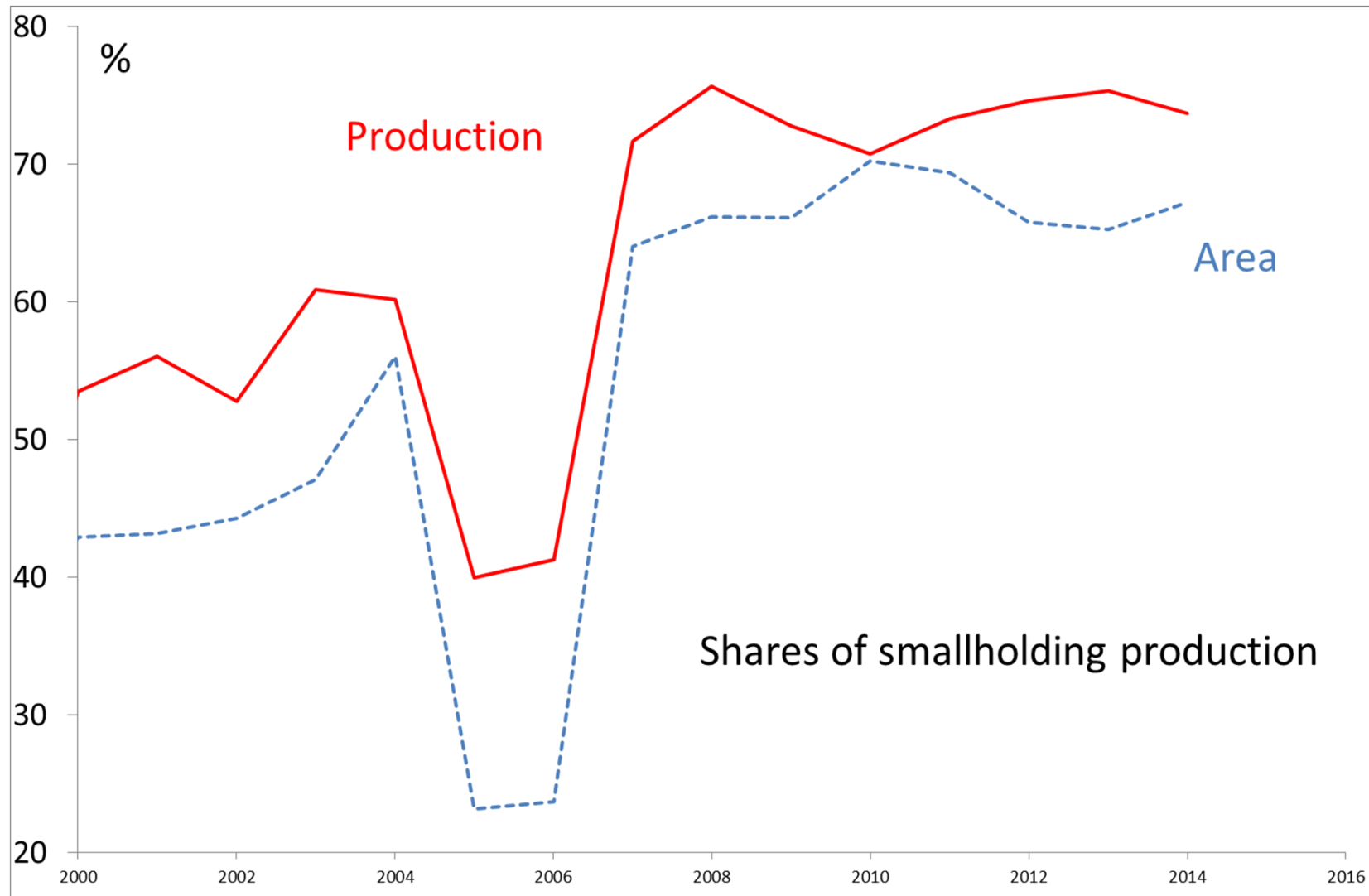
Production characteristics in small farm holding

- **Production for family subsistence**
 - frequent
 - at substantial degree
- **Small farm size, small cotton area**
- **Seldom mechanization**
 - Manual harvest: almost systematically
- **Labour availability: increasing constraint**
 - Family could be of large size
 - Family farming: little recourse, if any, to paid labour
- **Education level generally low**
 - along frequent social constraints
- **Dependence on rains**
- **Sensibility to cotton policies**

Production share in the world?

- ICAC: no specific stats
- Worth reporting these specific stats
 - A matter of social sustainability indicator of cotton production

Holding is small, share is big (my estimation from ICAC stats)



How to address challenges?

- Constraints to overcome are inter-related
- Analytical approach: convenient
 - Addressing constraints by type
- In practice
 - Be clever to make a mix of contemplated solutions

Subsistence feature : Challenges and rooms for gain

- **Cotton –food (potential) competition**
- **Common way:**
 - **ignore farmers' needs to produce food**
- **More courageous way:**
 - **Rationale to invest on food crops in cotton areas**
 - **⇒ potentially more land for cotton**
 - **Rationale of introducing techniques to gain productivity**
 - **Spill-over from cotton cropping to food cropping**
 - **Historic illustrations in Francophone African countries**



A cotton company
assisting farmers in
marketing maize
(Mali, 1984 &
1988)



Constraint of mechanization in small farms

- **Total manual farming is not rare**
 - **Animal-drawn agriculture not available everywhere**
 - **Rate of animal drawn equipment is stagnating if not decreasing**
- **Traditionally little motorized**
 - **Individual initiatives to adopt conventional tractors**
 - **Motorized cultivation types are limited in number (ploughing + transport mainly)**



Challenges to overcome the mechanization constraint

■ Technology challenge

- Adapting mechanization to small-middle size farming
- Be aware of a few achievements

■ Organizational and institutional challenge

- Overcome the financial resource limitation
 - Shared property of machineries
 - Access to machineries on service basis
 - Materialize the needed public investment to get started

Seeder: animal-drawn ou human-pushed



Machines operated by motors from motorcycles (Mali)



Multi-purpose 3_wheel tractor



Remaining challenge of worldwide importance

- How to mechanize harvest for small farms?
 - Experiences of adjusting the size of harvester
 - A new technology required?



Constraint and challenges from small cotton area

■ Constraints at cotton sector level

- Scattered production
 - Risk of higher transaction costs: frequently materialized
- Scattered decision about variety choice
 - Risk of lint quality decrease (heterogeneity...)
 - China

■ Solutions experimented successfully

- Marketing organized at producers' level
- Limiting the number of varieties used

Challenges from small cotton area

■ Constraints at producers' level

- How to produce more? And not only cotton
 - Common reaction: improve yield
 - Overlooked solution: improve the rate of land use



Challenges of improving yield on small cotton area

- More difficult according to input-intensive techniques
 - Requirements of cash expenses that many could not afford
- Easier to adopt techniques based on biological controls
 - Easier to implement than at larger scale
 - To control cotton pests
 - To control weeds

Illustrations of techniques more respective to ecology

The push-pull technique to control pests



Current Opinion in Biotechnology

Conventional push-pull field showing maize intercropped with silverleaf desmodium (*Desmodium uncinatum*) and with Napier grass (*Pennisetum purpureum*) planted as a border crop (left); climate-adapted push-pull field showing sorghum intercropped with drought tolerant greenleaf desmodium (*D. intortum*) and *Brachiaria* cv *mulato* II as a border crop (right).

What in poor or depleted soils: agro forestry





Challenges of improving output from small areas

- **Improve the rate of land use**
 - conduct more crops in a year
 - intercropping, relay-cropping
 - reduce any wastage of land: crop on any available space
- **Research topic: often neglected**
 - if not historically banned in many countries
 - Change is in the air now

Cotton multi-cropping modes



In China

Cotton inter-cropped with
Peanut
Chili pepper
Melon
Rapeseed
Soybean
Onion
Wheat...

Up to 3 crops in one cycle of cotton



← Cotton & potato

Cotton &
buckwheat...once
potato is
harvested





Labour availability: increasing constraint in family farming

■ Reasons are diverse

- More children going to school
- Children more reluctant to farm works
- ...

■ Challenges

- Reduce labour requirement
- Improve labour efficiency



Challenge of saving labour

- Herbicides can help saving labour to control weeds
 - But usually of time-limited efficiency
 - Need to combine with management of the cotton plant canopy
 - Unless using glyphosate herbicide even without GM varieties

Controlling the direction of sprays or sweeping weeds with a poisonous broom





Labour better efficiency from improved cultivation implementation

- Need to revisit some common practices
- Example of sowing at high/excessive dosage
 - \Rightarrow labour requirement for thinning
 - Late thinning \Rightarrow yield expectation decreases

Challenges from dependence to rainfalls

■ Constraints

- Dependence in a context of climate change
 - Uncertain settlement of rains and ends
- Lots of rains are lost
 - Negative impacts of wastage of rainfalls
 - Environmental
 - Economic
 - Social

Challenges from dependence to rainfalls

- Challenge of reversing the phenomenon of water wastage
 - Overcome the customs of seeing water running away
 - Capture water for agricultural use
 - Requirement for collective will
 - ...and political support

'Johads' in the arid state of Rajasthan





Challenges of adapting to low education of producers

■ Frequent constraint

- Producers not having benefitted from education
- Adapted training more or less abandoned

■ Challenges of having better cultivation practices by producers lacking education

- Opportunities provided by new technologies, notably mobile
- Possibility to adapt to the multitude of local languages
- New modalities need to be figured out and can be figured out

Adapting Mobile phone technology and radio programs to illiteracy

[Browse Conferences](#) > [Human Computer Interactions](#) (... ?)

Using technology to make farming easier and Simplified E-Farming Support (SEFS)

Mobile Phone Based Cotton Extension

– Evidences from e-Kapas Network

S. Usha Rani¹, S.M. Wasnik² and A.H. Prakash³

How radio shows for farmers in Bangladesh are boosting crop yields

Radio station in north-east Bangladesh enables farmers to share research and tips on seeds, pests and the changing climate



Challenges from dependence on cotton policy

- **Not the issue of waving any cotton policy**
 - A very harmful recommendation given
 - delete all state interventions
 - even those which have been successful
- **The issue is to establish efficient policy**
 - Very big issue, cannot be discussed in generic terms

Challenges from dependence on cotton policy

■ Some orientation

- Commitment of some duration
- Provide visibility over some period
- Measures to support productivity gain
 - *Research*
 - *Equipement*
 - *Training*
- Support/commitment to induce changes
 - *Enhancement of experimenting new modes of doing things*
 - *Show flexibility*
 - *Enhancement of experiences sharing*
 - *Capitalizing experiences*



In a nutshell

- Many challenges to face
 - But there are solutions in sight
- Solutions would not occur by magic
 - matter of investment in research
 - research & extension implementation to be adjusted
 - Production environment has to be made conducive for technical change

In a nutshell

- Challenges are inter-related
 - Solutions have to be combined
 - \Rightarrow More to do to improve the production environment
- How ?
 - Market force is not sufficient
 - Public intervention is needed

Thank you for your attention

